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To: Rhonda Jackson
FROM: Bernard Rax
SUBJECT: TID Test Report For CLC505 High Speed Programmable OpAmp
REFERENCES: W/O Y7159, RTR 479B, LOG NO. 1515,
IOM 514-E-019-92 To: R. Jackson From: B. Rax Subject: TID Testing on The Comlinear High Speed OpAmp

INTRODUCTION

All TID Testing and data correlation on the "Comlinear Corp" programmable high speed opamp has been completed. This devices is a bipolar based technology part. No previous TID tests on this particular device exists, however, the TID test data for the CLC501, a similar part, with minimal degradation at 25 krads(Si). Op Amp parametric test were done on the "Eagle" test system located in 300-119B.

RADIATION TEST

Six devices were provided for testing. Three test devices and one control unit were selected, these were the following: C62, C63, C64 while A30 was used as a control unit. Parameters tested for this device were the following: +Ips,-Ips,Vos,+Ib,-Ib, CMRR and PSRR.

All test devices were biased during irradiation, as shown in appendix C, using a dynamic bias. The test devices were irradiated at 5, 10, 20, 30, 50, 70, 90, 100, 130, 160, 200 and 240 krads(Si) at a dose rate of 100 rads/sec, and PIE data taken at 14 and 40 hrs. The 12 dose levels were made to obtain the most data should the device proved to be not so hardy.

The appendixes A thru E list all pertinent test information. Appendixes A is the block diagram for the EAGLE" OpAmp parametrics test. appendix B provides a schematic of the Dynamic biasing scheme during irradiation; appendix C lists the Radiation Test Requirements document; appendix D provides dose vs parameter plots of all the tested parameters. Appendix E lists in tabular form, raw test data. Please note that the graphs in appendix D, include the average parameter value and each of the three devices versus dose. Failure criteria is defined as a device exceeding manufacturers specifications.

RADIATION TEST &RESULTS

No test failures were observed for any device between 0 and 240 krads(Si) and the two P.I.E levels. However, parametric failure of CMRR thru 240 krads(Si) and all P.I.E levels were recorded, this failure was expected, and is due to test fixture stablization ciruitry required to keep the device from oscillating. The oscillation problem was first observed during initial "EAGLE" test developement. This problem can be eliminated by suitable by-pass capacitors placed close to the device positive & negative power and programming pin inputs with a capacitor placed at the inverting and non-inverting inputs of the device.

During the 200 krad increment, the devices's DC power supply input was accidentally left off (See Appendix B). No notable effects were observed as a result of this. The fllowing TID level of 240 krads(Si), resumed the normal bias condition used at previous TID levels, with no notable change in parametrics observed.

All TID increments up to and including 240krads, continued to show little or no change in parametrics. Although the CMRR parameter was not initially within manufacturer's spec, due to fixturing adjustments, total change observed was only a few tenths of a dB over the entire TID range, this was less than 1 %. For the Positive & Negative Supply current, the average change amounted to less than 1 mA, less than 1 %. Average Input Offset Voltage changed less than one milivolt, about 3 %. Average Input Bias current change was only 231 nA , about 4 %. The Power Supply Rejection Ratio changed less than 1 dB, or less than 1 % over the TID range.

The finial PIE increment of 24 hours, yielded the following expressed as a percent to initail values: +Ips showed 0.2% , -Ips showed 0.4%, Vos showed 2%, +Ib showed 1%, -Ib showed 3.5%, PSRR showed 0.1% and CMRR showed a 0.4% recovery.

All measured parameters are considered to have successfully achieved the TID level of 240 krad(Si) without failure.

SUMMARY

All devices tested remained within the manufacturer's specification up to and including 240 krad(Si) for the parameters of: +Ips, -Ips, Vos, +Ib, -Ib and PSRR. The initial failure of the parameter of CMRR was attributed to test fixure adjustments and not a device defieciency. The subsequent data for the CMRR is believed to be representitive of the in spec condition for the device. The PIE measurements showed some device recovery for the small changes in device parameters during irradiation. All devices tested remained operational with very little parametric degradation, with the most dramatic change occurring in Negative Input Bias Curent, (-Ib) of 4%. All others were less than 4%.

All test data remained consistent with test data obtained in a previous TID test of a similar Comlinear device, the CLC400AMD, which was tested to 1000 krads(Si) with negligable degradation and could be expected to meet Comlinear's spec's at the 3000 krad(Si) level.

Because the Cassini requirement is 100 krads(Si) and no device failures were observed at any of the tested TID levels and the device's failure threshold is in excess of 240 krad(Si), this device should be approved for Cassini applications.